
HATCHERY EVALUATION REPORT

Ringold Springs Hatchery - Summer Steelhead

September 1996

Integrated Hatchery Operations Team (IHOT)

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An Independent Audit Based on Integrated Hatchery Operations Team (IHOT) Performance Measures

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Executive Summary

This report presents the findings of the independent audit of the Ringold Springs Hatchery - Summer Steelhead program. The hatchery is located on the Columbia River, approximately 17 miles west of Mesa, Washington. The hatchery is used for adult collection, rearing, acclimation and release of spring chinook; acclimation and release of URB fall chinook; and rearing, acclimation, and release of summer steelhead.

The audit was conducted in 1996-1997 as part of a 2-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) "Strategy for Salmon" and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the Integrated Hatchery Operations Team (IHOT). IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination, (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995)*. That document is the source for the performance measures that are the basis of this audit.

The Audit Process

The audit was based on the facility management's response to a 109-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters.
- The hatchery manager was asked to fill out and return the audit form.
- A 1-2 day site audit visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans.
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and IHOT representative.
- This hatchery evaluation report was written to document compliance with IHOT performance measures and develop cost estimates for remedial actions when needed.

Ringold Springs Hatchery - Summer Steelhead Results

The Ringold Springs Hatchery includes a 9-acre earthen rearing pond and 14 vinyl raceways, Summer steelhead rearing facilities consist of a 4.8-acre earthen pond. The facility water supply consists of a gravity-flow, spring supply of approximately 27,000 gpm. The facility began operation in 1962 as part of the Columbia River Fisheries Development Program, a program to mitigate for fishery losses due to hydroelectric development in the Columbia River basin.

The Ringold Springs Hatchery Summer Steelhead program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery did not meet its fry-to-smolt survival goal as a result of heavy losses of fish to bird predation. In the area of facility requirements, the audit found that the hatchery was not in compliance with the IHOT criteria for water quality in the areas of dissolved gases, chemistry, alkalinity and hardness, nitrite, and contaminants due to a lack of analyses for these parameters. The hatchery also did not have alarms at several recommended areas, did not follow IHOT recommendations for the frequency of monitoring alarms, and needs predator control for the large earthen rearing pond. The facility did also not meet several IHOT recommendations in the area of food storage quality control. In the area of hatchery practices, the audit found that the hatchery did not have a density and loading criteria for rearing, did not measure smoltification, and did not have written criteria for percent smoltification. The facility also needs to develop several training protocols to be in line with IHOT recommendations. In the area of genetics policy, the audit found that the hatchery did not have a Genetics Monitoring and Evaluation Program in place, but this program should probably be developed at Skamania Hatchery where the adults are collected.

The specific areas in which the Ringold Spring Hatchery - Summer Steelhead program requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Adopt IHOT recommendations for monitoring food production
- Conduct appropriate fishery contribution studies
- Develop a genetics M&E program in line with IHOT policies and procedures
- Develop density and loading criteria for earthen pond
- Develop goal for fry-to smolt survival for IHOT Operations Plan
- Develop goal for smolt-to-adult survival
- Develop training protocols in line with IHOT recommendations
- Develop written monitoring and evaluation plan
- Implement IHOT monitoring schedule for alarm system checks
- Install appropriate alarms on the intake and rearing pond, improve security at the broodstock collection area
- Install new discharge pipe for earthen pond to river
- Measure smoltification and develop written smoltification criteria
- Provide new food storage unit for dry and moist foods
- Provide predator control on 4.8-acre pond to increase fry to smolt survival
- Run analysis for alkalinity and hardness
- Run analysis for chemistry parameters where no data is available
- Run analysis for contaminants
- Run analysis for nitrite

- Run analysis for TGP

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery (Type 1 in Table 3, Section 4 of this report) were not listed above.

Facility Description

Name:	Ringold Springs Hatchery
Stock/Species:	Spring Chinook Summer Steelhead Fall Chinook
Operating Agency:	Washington Department of Fish and Wildlife
Funding Agency:	NMFS through the Columbia River Fisheries Development Program
Location:	About 17 miles west of Mesa, WA on the Columbia River
Address:	Ringold Springs Hatchery 1871 Ringold River Road Mesa, WA 99343
Hatchery Manager:	Mr. Art Brown
Phone:	(509) 269-4448
Fax:	(509) 269-4408
Purpose:	Ringold Springs Hatchery serves as an adult collection, rearing, and release facility for spring chinook, rearing and release for summer steelhead, and final rearing and release for fall chinook.
Production Goal:	Spring Chinook Produce 1,100,000 smolts Summer Steelhead Produce 180,000 smolts URB Fall Chinook Final rearing for 3,500,000
Water Supply:	Springs supplying approximately 27,000 gpm
Facilities:	
Adult Holding:	Short-term holding within channel of the trap
Incubation:	N/A
Early Rearing:	N/A
Raceways:	14 8'x 80' vinyl raceways - 1920 cf each

Rearing Ponds:	1 9-acre earthen rearing pond
	1 4.8-acre earthen rearing pond
Satellite Facilities:	N/A

Section 3

Compliance Status

The hatchery audits are based on compliance with written IHOT performance measures. These performance measures are documented in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (referred to as *IHOT 1995* in this report).¹ The purpose of the performance measures is to implement new basinwide policies that provide regional guidelines for operating anadromous hatcheries in the Columbia Basin.

The audit focuses on performance measures for IHOT policies that cover (1) hatchery performance standards, (2) fish health, (3) ecological interaction, and (4) genetics. These performance measures are intended to guide hatchery operations once production is established. For that reason, the hatchery operations audit included broodstock collection, spawning, incubation of eggs, fish rearing and feeding, fish release, equipment maintenance and operations, and personnel training. Production priorities are beyond the scope of this audit.

Based on *IHOT 1995*, a detailed 109-page audit form was developed. The audit form divided the performance measures into six major sections along major program and technical criteria areas. Two additional sections (sections 1 and 8) include general information and expenditure information needed for this Hatchery Evaluation Report and blank forms for additional comments. The following is the basic structure of the IHOT audit form:

Section 1	Performance Measures for General Information and Expenditure Information (PMs General 1-2)
Section 2	Performance Measures for Program Objectives (PMs 1-4)
Section 3	Performance Measures for Facility Requirements (PMs 5-15)
Section 4	Performance Measures for Hatchery Practices (PMs 16-25)
Section 5	Performance Measures for Fish Health Policy (PMs 26-34)
Section 6	Performance Measures for Ecological Interactions (PMs 35-38)
Section 7	Performance Measures for Genetics Policy (PMs 39-43)
Section 8	Blank Forms for Additional Comments

Several performance measures are repeated in various sections of the audit form. These performance measures overlap in *IHOT 1995* and were retained to allow individuals interested in specific portions of the audit (such as Genetics or Fish Health) to determine the compliance status of all performance measures for a given topic in one location. A repeated performance measure is indicated by shaded text.

The Hatchery Audit Process

The hatchery audit will be conducted over a 2-year period that concludes in 1997. At each hatchery, a five-step process was used to complete the overall hatchery audit. This process consisted of research and onsite visits. The site visit at the Ringold Springs Hatchery was conducted on September 20, 1996.

¹Integrated Hatchery Operations Team (IHOT) 1995. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*, Bonneville Power Administration, Portland, Oregon.

The following is the five-step audit process:

1. Information was obtained from headquarters.
2. The hatchery manager was asked to fill out and return the **Audit Form**.
3. A 1-2 day site audit visit was conducted at each hatchery. During that visit an audit team inspected facilities, reviewed hatchery records, discussed audit form responses, and developed remedial action plans when appropriate.
4. During the site visit, the compliance status of each performance measure was discussed with the hatchery manager and IHOT representative. A portion of the Hatchery Evaluation Report was sent to the hatchery manager following the audit site visit as a **Compliance Report**. That Compliance Report is Table 2 of this report.
5. The information from steps 1-4 was used to prepare a draft **Hatchery Evaluation Report**. This draft report was submitted to the operating agencies for review of the information used to determine compliance. Based on review and comments, a final Hatchery Evaluation Report was developed. The final report documents the compliance of a particular hatchery with the IHOT performance measures and presents cost estimates to correct any deficiencies.

Compliance Status of Ringold Spring Hatchery - Summer Steelhead

The following table includes information on life-stages that are held on this facility for some portion of their rearing cycle (Table 1). For multi-facility programs, summary cost and contribution data is presented at the facility where rearing occurs. For the compliance status relating to performance measures that do not occur at this hatchery, please refer to the Hatchery Evaluation Reports for the hatcheries and stocks listed in Table 1. A check mark (✓) indicates that the specific life stage is held at this facility.

This section documents the compliance status of the Ringold Spring Hatchery - Summer Steelhead program. Each performance measure is presented in a table taken from the audit form (Table 2). The compliance status is identified by the following categories:

- **N/A** (not applicable)
- **Yes** (in compliance)
- **?** (unknown; generally due to unavailability of information to determine compliance)
- **No** (not in compliance).

Remedial actions are suggested for performance measures not in compliance. These remedial actions are grouped into categories and listed in Section 4 of this report, where the cost of the required remedial actions is also presented.

Table 1 Summary Program Information for Ringold Spring Hatchery - Summer Steelhead

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Skamania Hatchery	Lyons Ferry Hatchery	Ringold Springs Hatchery			
Adult Collection	✓					
Adult Holding	✓					
Spawning	✓					
Fertilization	✓					
Incubation	✓					
green-to-eyed		✓				
eyed-to-hatch		✓				
Rearing						
fry		✓				
fingerlings			✓			
smolts			✓			
Acclimation/release			✓			

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
the hatchery programs outlined in a subbasin management plan?		✓			Columbia Basin System Planning, Mid-Columbia River Subbasin 1990	
ie hatchery operating under a current hatchery operational plan?		✓			IHOT Operations Plan and Operations Report-Ringold Springs Hatchery	
s it understood by staff?		✓				
s it being followed?		✓				
hatchery monitoring and evaluation plan in place?						
do you have a written monitoring and evaluation plan?				✓	None provided to team	Develop written monitoring and evaluation plan
ilt contribution to fisheries, spawning grounds, and chery		✓			Data provided by hatchery for fisheries contribution; nothing listed in Missing Production Groups Annual Report for 1994	
ult pre-spawning survival as compared with blished goal	✓				No adults held on station; occurs at Lyons Ferry	
egg take as compared with established hatchery goal	✓				No egg take on station; occurs at Lyons Ferry	
en-egg to eyed-egg survival as compared with blished goal	✓				No incubation on station; occurs at Lyons Ferry	
d-egg to fry survival as compared with established l	✓				No incubation on station; occurs at Lyons Ferry	
to smolt survival as compared with established goal				✓	Review of records; in compliance 4 out of last 5 years	Improve predator control in 4.8-acre rearing pond Develop goal for fry-to-smolt survival for IHOT Operations Plan
duction as compared with established goal		✓			Review of records; in compliance 5 out of last 5 years	
cent survival (smolt to adult) as compared with blished goal			✓		No goal listed in Operations Plan	Develop goal for smolt-to-adult survival

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
number of eggs, fry, fingerlings, smolts, and/or adults meet basinwide needs	✓				Review of records/Discussion. Not a compliance measure	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Temperature						
Does your water temperature meet the criteria for spawning?	✓				No adults held on station	
Does your water temperature meet the criteria for incubation?	✓				No incubation on station	
Does your water temperature meet the criteria for rearing?		✓			Review of records/Discussion,	
Dissolved gases						
Is the oxygen level near saturation?		✓			Review of records/Discussion	
Is the dissolved nitrogen level less than saturation?			✓		No data	Run the analysis for TGP
Chemistry						
Ammonia (un-ionized)			✓		No data	Run the analysis for ammonia
Carbon Dioxide			✓		No data	Run the analysis for carbon dioxide
Chlorine			✓		No data	Run the analysis for chlorine
pH		✓			Review of records/Discussion	
Copper			✓		No data	Run the analysis for copper
Hydrogen Sulfide			✓		No data	Run the analysis for hydrogen sulfide
Iron		✓			Review of records/Discussion	
Zinc			✓		No data	Run the analysis for zinc
Turbidity						
Does your turbidity meet the criteria?	✓				Spring water with no visible turbidity	None
Alkalinity and hardness						
Does your alkalinity and hardness meet the criteria?			✓		No data	Run the analysis for alkalinity and hardness
Nitrite						
Does your nitrite meet the criteria?			✓		No data	Run the analysis for nitrite

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Contaminants Aldrin Dieldrin Heptachlor Chlordane Methoxychlor Endane Malathion Buthion			✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓		No data No data No data No data No data No data No data No data No data	Run the analysis for contaminants
hogens What portions of the hatchery have disease-free water? Adult holding Incubation Early rearing Rearing Truck fill station	✓ ✓	✓ ✓ ✓			No adults on station No incubation on station Inspection of facilities/Discussion Inspection of facilities/Discussion Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Alarm Systems						
Do the following areas have alarms?						
Intake				✓	Inspection of facilities/ Discussion	Install appropriate alarms
Large rearing ponds and adult holding ponds				✓	Inspection of facilities/ Discussion	Install appropriate alarms
Raceway headboxes and rearing ponds		✓			Inspection of facilities/ Discussion	
Incubation facilities	✓				None	
Quarantine areas and facilities	✓				None	
Water treatment systems	✓				None	
Security				✓	On-site staff conduct security checks, no automated systems	Improve security at brood collection area
Are there outside systems and buzzers in on-site residences?		✓			Discussion	
Are water flow alarms checked daily?				✓	Review of records/Discussion	Adopt IHOT recommendations for frequency of checking alarms
Are all other alarms checked weekly?		✓			Discussion	
Is there a log of alarms for emergencies, tests, and maintenance requirements?				✓	Review of records/Discussion	Adopt IHOT recommendations for frequency of checking alarms
Are telephone pagers used?				✓	Residences are hard-wired to alarm systems	None. Not a problem

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Ult collection and holding facilities						
Do you meet the adult holding criteria?	✓				Inspection of facilities, discussion	
Incubation facilities						
Type 1: none Do you have an adequate number of units for the overall program?	✓				No incubation on station	
Feeding facilities						
Type 1: Earthen pond Do you have an adequate number of units for the overall program?		✓			Inspection of facilities. Water supply being upgraded, could use bird netting	
Screening facilities						
Do you meet the approach velocity criteria?	✓				Spring water supply; screens not needed	
Are the fish screens regularly cleaned?	✓				see above	
Does the screen mesh meet screen opening criteria?	✓				see above	
Are rearing containers double screened for fish that should not be released to adjacent water?	✓				All fish held are released at this site	
Predator control facilities						
Are your predation control facilities effective?				✓	Inspection of facilities/Discussion	Provide new screening over pond

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
d storage facilities and quality control						
Does the storage of dry/semi-moist/moist foods (dry<12%; semi-moist 12-20%; moist >20% moisture) follow food manufacturer's recommendations?		✓			Inspection of facilities/Discussion	
Does a regional quality control officer oversee production procedures and monitor:						
Verification by feed manufacturer that ingredients meet specifications?				✓	Discussion	Adopt IHOT recommendations for monitoring food production
Ensure feed does not contain unwanted drugs or other additives?				✓	Discussion	Adopt IHOT recommendations for monitoring food production
Analyze ingredients contained in the final food product to ensure that feed specifications have been met?				✓	Discussion	Adopt IHOT recommendations for monitoring food production
Are the foods stored and handled according to the following criteria?						
Moist pellets should not exceed 10 °F at point of delivery.		✓			Discussion	
Moist pellets should be removed from freezer just prior to feeding.		✓			Discussion	
Do not leave buckets of feed or feed containers outside exposed to light or heat.		✓			Discussion	
Open bags of feed should be fed within one to two days except when feeding small groups of fish.		✓			Discussion	
Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80°F and above).				✓	Bulk storage interior can exceed 80 °F on hot days	Provide new feed storage unit on site for storage of dry and moist feed

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Release facilities						
Do the release facilities ensure that fish are not subjected to adverse conditions?				✓	Inspection of facilities/Discussion	Install new discharge pipe from earthen pond to the river
Pollution abatement facilities						
Do the pollution abatement facilities meet all federal and state regulations (or good engineering practice)?		✓			Inspection of facilities/Discussion	
Are pollution abatement facilities operated correctly?		✓			Discussion	
Transportation facilities						
Are the transport systems adequate to meet IHOT performance measures for transportation practices?	✓				Inspection of facilities/Discussion.	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Broodstock selection practices						
Is the donor selection process document attached?	✓				Existing program; does not apply	
Was the donor selection outline followed in selecting the hatchery broodstock?	✓				Existing program; does not apply	
to PM #40 in Genetics Section						
Spawning practices						
Were the appropriate number of spawners, male/female ratios, and fertilization protocols used?	✓				Review of records/Discussion. Spawning occurs at Lyons Ferry Hatchery	
to PM #42 in Genetics Section						
Incubation practices						
Are specific incubation standards listed in the hatchery operations plan?	✓				No incubation on station	
Are incubation practices written?	✓				No incubation on station	
Incubation Type 1: None (see PM #8) Do you meet the loading and flow criteria?	✓				No incubation on station	
Rearing practices						
Are specific rearing standards listed in the hatchery operations plan?		✓			Reviewed IHOT Operations Plan and facility plan	
Are rearing practices written?		✓			Review of facility plan	
Rearing Unit Type 1: <u>earthen pond</u> (see PM #9) Do you meet the density and DI criteria?			✓		No criteria for this program	Develop density criteria for this program
Do you meet the Loading and FI criteria?			✓		No criteria for this program	Develop loading criteria for this program

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Smolt quality						
Do you produce a high quality smolt?		✓			Discussion	
Health management practices						
Are the monthly hatchery monitoring visits being conducted? (PM #26)		✓			Review of records/Discussion	
Are the annual broodstock inspections being conducted? (PM #27)		✓			Review of records/Discussion	
Is there pathogen-free water and are the sanitation procedures being followed? (PM #28)		✓			Review of records/Discussion	
Are the following water quality parameters within criteria? (PM #5a-5h)						
Water temperature		✓			Review of records/Discussion	
Dissolved gases				✓	Review of records/Discussion	Run analysis for TGP
Chemistry				✓	Review of records/Discussion	Run analysis for chemistry parameters
Turbidity	✓				Spring water; no turbidity problems	
Alkalinity and hardness			✓		No data	Run analysis for alkalinity and hardness
Nitrite			✓		No data	Run analysis for nitrite
Contaminants			✓		No data	Run analysis for contaminants
Are rearing standards being followed? (PM #19)				✓	No criteria for this program	Develop density and loading criteria for this program
Are egg and fish transfer/release requirements met? (PM #31)		✓			No egg transfer on station. Release requirements are met	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Do hatchery performance meet requirements defined in the regional hatchery policies and in the basin and hatchery plans for the following areas?</p> <p>Percent smoltification</p> <p>Do you measure percent smoltification?</p> <p>Did you meet the smoltification criteria?</p>				<p>✓</p> <p>✓</p>	<p>Discussion</p> <p>No established index or goal for smoltification</p>	<p>Measure smoltification</p> <p>Develop written criteria and goals for smoltification</p>
<p>Rearing density (prior to release)</p> <p>Did you meet the rearing density criteria just prior to release?</p>			✓		No criteria for this program	Develop density criteria for this program
<p>Disease condition (at release)</p> <p>Did you meet all disease regulations just prior to release?</p>		✓			Review of records/Discussion	
<p>Release number (at release)</p> <p>Did you meet the release number goal?</p>		✓			Review of records/Discussion	
<p>Release size (at release)</p> <p>Did you meet the size goal?</p>		✓			Review of records/Discussion	
<p>Release date (at release)</p> <p>Did you meet the release date goal?</p>		✓			Review of records/Discussion	
<p>Release location (at release)</p> <p>Did you release the fish at the specified location?</p>		✓			Review of records/Discussion	
<p>Are fish reared in the subbasin or acclimated in the basin?</p> <p>Are the fish reared in the subbasin?</p> <p>Are the fish acclimated in the subbasin?</p>		<p>✓</p> <p>✓</p>			<p>Discussion</p> <p>Discussion</p>	
<p>Is the release strategy appropriate for the program?</p>		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Transportation facilities						
Do transportation equipment and personnel receive disinfection before and after use?	✓				No transportation for this program	
Is the fish tank interior disinfected using a solution of 100 ppm active chlorine for 30 minutes minimum or formaldehyde gas generation method (relative humidity of 60% for 2 hrs)?	✓				Discussion	
Is the exterior of the fish transport vehicle disinfected using high pressure steam (115-130°C), high temperature acid, or with 200 ppm chlorine for 30 minutes?	✓				Discussion	
Is the fish transport vehicle (cab) disinfected using 600 ppm quaternary ammonia compounds (1.5 ml of 50% stock solution/liter water)?	✓				Discussion	
Is other equipment disinfected including fish pumps, nets, egg sorters, waders, boots, rain gear, hoses and other equipment using one of the following solutions?		✓			Discussion	
200 ppm chlorine for 30 minutes 600 ppm quaternary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes					truck everything else	
Do personnel wear protective garments when handling fish eggs or cultural water?	✓				No eggs on station	
Do the fish transport truck/chassis and tank/unit receive an inspection and service prior to the release season?	✓				Discussion	
Is a daily service inspection completed before starting pump and leaving for the day?	✓				Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Transportation facilities						
Does the fish transport unit receive an inspection prior to loading?	✓				Discussion	
Does a pre-loading inspection covering: tank water level, pumps or aerators, oxygen injection system settings, displacement gauge, and truck loading/hauling density tables checked and reviewed occur prior to loading fish in the transport unit?						
Do hauling criteria include checking the fish 45 minutes to 1 hour after loading ?	✓				Discussion	
When fish are active and systems are functioning properly, is the oxygen concentration reduced and maintained at approximately 8 ppm?	✓				Discussion	
Is water temperature in the transportation unit maintained within the 42-48 °F range?	✓				Discussion	
Do fish releasing procedures include the following criteria?						
Releasing the fish at the correct release site or into the correct water body.	✓				Discussion	
Tempering or the difference between the liberation tank and the target water body should not exceed 10°F.	✓				Discussion	
The liberation hose should be angled so that fish gently hit the water. Using a tripod is a method of ensuring the hose will stay at the proper angle.	✓				Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Evaluation practices						
Has the hatchery conducted fishery contribution studies?						
Determine the requirements for evaluating and improving management programs?				✓	Discussion	Conduct the appropriate fishery contribution studies
Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?				✓	Discussion	
Develop guidelines that define if the proper stocks of fish are currently being used?				✓	Discussion	
Determine which management units contribute to a specific fishery and the time periods of those contributions?				✓	Discussion	
Determine the relative contributions of the various management units to a specific fishery over the different time periods?				✓	Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ining practices						
Does the hatchery have a training schedule for its staff?				✓	Review of records/Discussion	Develop training protocols in line with IHOT recommendations
Does each staff member have a personal training plan approved by a supervisor and reviewed annually?				✓	Review of records/Discussion	Develop training protocols in line with IHOT recommendations
Does the hatchery routinely exchange training details between other hatcheries and agencies?		✓			Review of records/Discussion	
Does the hatchery encourage and reward off-duty training of staff?				✓	Review of records/Discussion	Develop training protocols in line with IHOT recommendations
Does the hatchery conduct monthly staff meetings?		✓			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>monthly hatchery monitoring visits being conducted by a qualified fish health specialist as described below?</p> <p>Conduct visit at least monthly</p> <p>Monitoring conducted by qualified fish health specialist</p> <p>Examine a representative sample of healthy and moribund fish from each lot.</p> <p>Review fish culture practices with hatchery manager.</p> <p>Report finding and results of necropsies on standard form.</p> <p>Recommend appropriate drug or chemical treatment.</p> <p>Summarize fish health status or stock prior to release or transfer to another facility.</p>			✓		<p>Phase 2 fish health audit of WDFW not complete at this time</p> <p>Phase 2 fish health audit of WDFW not complete at this time</p> <p>Phase 2 fish health audit of WDFW not complete at this time</p> <p>Phase 2 fish health audit of WDFW not complete at this time</p> <p>Phase 2 fish health audit of WDFW not complete at this time</p> <p>Phase 2 fish health audit of WDFW not complete at this time</p> <p>Phase 2 fish health audit of WDFW not complete at this time</p>	
<p>all of the functions of the hatchery yearly monitoring visits being completed as described below?</p> <p>Annually examine each broodstock for the presence of reportable viral pathogens.</p> <p>Annually screen each salmon broodstock for the presence of <i>Renibacterium salmoninarum</i>.</p> <p>Conduct inspection by or under the supervision of qualified fish health specialist.</p>			✓		<p>Phase 2 fish health audit of WDFW not complete at this time</p> <p>Phase 2 fish health audit of WDFW not complete at this time</p> <p>Phase 2 fish health audit of WDFW not complete at this time</p>	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Are hatchery sanitation procedures following accepted sanitation procedures?						
Are there any sources of pathogen-free water, especially for incubation and early rearing?	✓				No incubation or early rearing on station	
Are the hatchery sanitation procedures understood and being followed as described below?						
Disinfect/water harden eggs in iodophor?	✓				No incubation on station	
Are foot baths containing disinfectant placed at the incubation facility's entrance and exit?	✓				No incubation on station	
Is equipment and rain gear utilized in broodstock handling or spawning sanitized prior to its use elsewhere in the hatchery?	✓				No spawning on station	
Is equipment used to collect dead fish sanitized prior its use in another pond and/or lot of fish?		✓			Inspection of facilities/ Discussion	
Is equipment, including vehicles used to transfer fish between facilities, disinfected prior to use with any other fish lots or at any other location?	✓				Inspection of facilities/ Discussion	
Are rearing vessels sanitized after fish are removed and prior to introducing a new fish lot or stock?	✓				Inspection of facilities/ Discussion	
Are dead fish properly disposed of?		✓			Inspection of facilities/ Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
water quality parameters being followed?						
Are the following water quality parameters within criteria? (PM #5a-5h)						
Water temperature		✓				
Dissolved gases			✓			Run analysis for TGP
Chemistry			✓			Run analysis for chemistry parameters
Turbidity		✓				
Alkalinity and hardness			✓		No data	Run analysis for alkalinity and hardness
Nitrite			✓		No data	Run analysis for nitrite
Contaminants			✓		No data	Run analysis for contaminants
Go to PM #21						
incubation and rearing standards being followed?						
Are the incubation practices following the IHOT incubation criteria? (PM #18)	✓				No incubation on station	
Are the rearing practices following the IHOT criteria? (PM #19)			✓		No density or loading criteria for this program	Develop density and loading criteria for this program
Go to rearing practices PM #18-PM #19						
egg and fish transfer/release requirements met?	✓				Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Is the hatchery's program outlined in a subbasin management plan?</p> <p>Go to subbasin plan PM #1</p>		✓			Columbia Basin System Planning Production Plan and Facility operations plan	
<p>Is the hatchery operating under a current hatchery operational plan?</p> <p>Go to operational plan PM #2</p>		✓			Review IHOT Operations Plan and Facility operations plan	
<p>Is hatchery monitoring and evaluation plan in place?</p> <p>Go to hatchery monitoring and evaluation plan PM #3</p>				✓	No hatchery monitoring and evaluation plan provided to team	Develop hatchery monitoring and evaluation plan

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Does the hatchery program meet requirements established in the regional hatchery policies and basin planning documents in the following areas: species, stock, broodstock collection location, broodstock numbers, broodstock collection strategy, spawning and egg-take protocols?						
Does the hatchery program meet the requirements for the following?						
Species protocols (PM #4a)		✓			Review of records/Discussion	
Stock protocols (PM #4a)		✓			Review of records/Discussion	
Broodstock collection location protocols (PM #41)	✓				No collection on station	
Broodstock numbers protocols (PM #42)	✓				No collection on station	
Broodstock collection strategy protocols (PM #41)	✓				No collection on station	
Spawning protocols (PM #42)	✓				No spawning on station	
Egg-take protocols (PM #42)	✓				No spawning on station	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Do the hatchery's performance meet requirements defined in the regional hatchery policies and in the subbasin and hatchery plans for the following areas: percent smoltification, rearing density, disease condition, and the number, size date(s), and location of release?</p> <p>Percent smoltification (PM #22a1)</p> <p>Rearing density (PM #22a2)</p> <p>Disease condition (PM #22a3)</p> <p>Number at release (PM #22a4)</p> <p>Size at release (PM #22a5)</p> <p>Date of release (PM #22a6)</p> <p>Location of release (PM #22a7)</p>				<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>Review of records/Discussion</p> <p>No density or loading criteria</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p> <p>Review of records/Discussion</p>	<p>Measure smoltification and develop written percent smoltification criteria</p> <p>Develop density or loading criteria</p>
<p>Are fish reared in the subbasin or acclimated in the subbasin?</p> <p>PM #22b</p>		✓			<p>Fish are reared and acclimated in the subbasin</p>	
<p>Is the release strategy appropriate for the program?</p> <p>PM #22c</p>		✓			<p>Discussion</p>	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
new programs, has a broodstock collection plan developed?						
Is the broodstock collection plan written?	✓				Existing Program; does not apply	
For a non-captive broodstock program:	✓				Existing Program; does not apply	
Was an unbiased, representative sample collected?						
Was the recommended number of broodstock collected?	✓				Existing Program; does not apply	
For a captive broodstock program:						
Were captive brood progeny excluded as donors for propagating the next generation of the captive broodstock program?	✓				Existing Program; does not apply	
Were full-sib crosses avoided?	✓				Existing Program; does not apply	
Is the broodstock collection plan understood and being followed by staff?	✓				Existing Program; does not apply	
a new program, was the donor selection outline followed in selecting the hatchery broodstock?						
Is a donor selection plan written?	✓				Existing Program; does not apply	
Was the donor selection outline followed in selecting the broodstock?	✓				Existing Program; does not apply	
Was the target stock recommended in the donor selection process actually used?	✓				Existing Program; does not apply	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
existing programs, were the broodstock collection cedures followed?						
Is the broodstock collection plan written?	✓				Broodstock collected at Skamania Hatchery	
Does the broodstock collection plan follow the guideline:						
Was an unbiased, representative sample collected?	✓				Discussion	
Was the recommended number of broodstock collected?	✓				Discussion	
Were the broodstock collection procedures in hatchery operation plan understood and followed?	✓				Discussion	
Were the broodstock collection procedures in hatchery operation plan understood and followed?	✓				Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Was the appropriate number of spawners, male/female ratio, and fertilization protocols used?					Adults spawned at Skamania Hatchery	
Are the spawning protocols written?	✓					
Are daily or weekly spawning logs available?	✓					
Was the appropriate number of spawners used?	✓					
Did you attempt to spawn all collected broodstock and randomize mating with respect to age class, and other traits?	✓					
Was the sex-ratio within the limits given in the performance standards?	✓					
Were the fertilization protocols followed?	✓					
If the hatchery needed to reduce the number of eggs retained, was this done by representative sampling of each male/female cross?	✓					

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Is there a genetics monitoring and evaluation program in place?</p> <p>Is a genetics monitoring and evaluation program available?</p> <p>Does the plan address the following elements listed in HOT:</p> <p>Does the program have elements needed to meet evaluation goals 1-4?</p> <p>Has a qualified geneticist reviewed and endorsed the program (goal 5)?</p> <p>Will the program collect the data and maintain the records needed to evaluate compliance on an ongoing basis (goal 5)?</p> <p>Is the program understood and followed by staff?</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>				<p>Adult are collected at Skamania Hatchery; a genetics monitoring and evaluation program should be based at this hatchery</p>	

Section 4

Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions are organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control, to those that require a change in agency policy or procedures, to those that involve a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

The Five Types of Remedial Actions

Type	Description
1	Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery
2	Remedial actions requiring changes in agency policies or procedures
3	Remedial actions requiring changes in monitoring coverage or interval
4	Remedial actions requiring significant capital expenditures
5	Remedial actions that may require significant capital expenditures but are not clearly definable at this time

Remedial Actions at Ringold Spring Hatchery - Summer Steelhead

This section presents the corrective actions required to bring the Ringold Spring Hatchery - Summer Steelhead program into compliance with IHOT performance measures. The remedial actions suggested here are just that, suggestions developed by the Montgomery Watson Audit Team. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Table 3).

The cost estimates presented in this section are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented, and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates ($\pm 40\%$).

More importantly, the suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.

Table 3. Remedial Actions Required at Ringold Spring Hatchery - Summer Steelhead

Remedial Action Required	Cost	PMs¹
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery Provide telephone pagers; however, not a problem for this hatchery because residences are hard-wired to alarm system	---	6
Type 2 - Remedial actions requiring changes in agency policies or procedures Develop written monitoring and evaluation plan Develop goal for fry-to smolt survival for IHOT Operations Plan Develop goal for smolt-to-adult survival Implement IHOT monitoring schedule for alarm system checks Adopt IHOT recommendations for monitoring food production Develop density and loading criteria for earthen pond Measure smoltification and develop written smoltification criteria Develop training protocols in line with IHOT recommendations Develop a genetics M&E program in line with IHOT policies and procedures	 --- --- --- --- --- --- --- --- --- ---	 6 3, 34 4f 4h 6 12 19, 22a2, 30, 36 22a1, 36 25 43
Type 3 - Remedial actions requiring changes in monitoring coverage or interval Run analysis for TGP Run analysis for chemistry parameters where no data is available Run analysis for alkalinity and hardness Run analysis for nitrite Run analysis for contaminants Conduct appropriate fishery contribution studies	 --- --- --- --- --- ---	 5c, 21, 29 5c, 21, 29 5e, 21, 29 5f, 21, 29 5g, 21, 29 24

¹ PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Remedial Action Required	Cost	PMs ¹
Type 4 - Remedial actions requiring significant capital expenditures		
Provide predator control on 4.8-acre pond to increase fry to smolt survival	\$400,000	4f, 11
Install appropriate alarms on the intake and rearing pond, improve security at the broodstock collection area	\$20,000	6
Install new discharge pipe for earthen pond to river	\$50,000	13
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
Provide new food storage unit for dry and moist foods	---	12

¹ PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Ringold Spring Hatchery - Summer Steelhead contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries. Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For some species, this may include fish caught as 2-, 3-, 4-, 5-, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4 to 5 years after the fish have been released from the hatchery.

**Table 4. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:
Ringold Spring Hatchery - Summer Steelhead**

Year	Fisheries¹ (Broodyear)	Spawning Grounds¹ (Broodyear)	Hatchery¹ (Broodyear)	Total Combined Contribution¹ (Broodyear)	Smolt to Adult Survival (percent)
1984	2,267	no data available	no data available		no data available
1985	3,928	no data available	no data available		no data available
1986	3,680	no data available	no data available		no data available
1987	3,578	no data available	no data available		no data available
1988					
1989					
1990					
1991					
1992					
1993					
1994					
1995					

¹ Data obtained from Missing Production Groups Annual Report or from the Regional Mark Information System database.

¹ Total combined adult contribution; presented when it is not possible to subdivide the contribution into fisheries, spawning grounds, and hatchery contributions.

Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged to the federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program were estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. Table 5 shows the annual operating expenses for the Ringold Spring Hatchery - Summer Steelhead program. For programs that occur at more than one facility (as shown on Table 1 in Section 3 of this report), the cost breakdown for the component(s) at each facility is presented in separate tables (Tables 5a, 5b and 5c).

Table 5. Annual Operating Expenses: Ringold Springs Hatchery - Summer Steelhead

Hatchery	1994	1995	1996
1. Ringold Springs	\$100,000	\$100,000	\$100,000
2. Lyons Ferry			
3. Skamania			
4.			
5.			
Total Program Costs	not available at this time	not available at this time	not available at this time

The total expenditures for the Ringold Springs Hatchery are presented in Table 6 by program. The detailed breakdown of program expenditures at this hatchery is presented in separate tables (Tables 6a, 6b, and 6c).

Table 6. Annual Operating Expenses - Ringold Springs Hatchery

Program	1994	1995	1996
1. Summer Steelhead	\$100,000	\$100,000	\$100,000
2. Spring Chinook	\$262,225	\$274,376	\$185,645
3. URB Fall Chinook	\$20,000	\$20,000	\$40,000
4.			
5.			
Total Hatchery Costs	\$382,225	\$394,396	\$325,645

Table 5a. Annual Operating Expenses: Ringold Spring Hatchery - Summer Steelhead

Expenditure Occurring at Ringold Springs Hatchery

Component	1994	1995	1996
Personnel Costs			
Operational Costs			
Capital Costs			
Indirect Costs			
Lumped Hatchery Costs ¹	\$382,225	\$394,396	\$325,645
Lumped Third-Party Costs	\$0	\$0	\$0
Total Hatchery Costs	\$382,225	\$394,396	\$325,645
Source of Funds			
NMFS - 100%			
Program Production (#)	175,648	168,217	167,548
Total Production (#)	5,671,139	4,873,112	4,549,170
Program as Percent of Total	N/A	N/A	N/A
Program Costs²	\$100,000	\$100,000	\$100,000

¹ When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

² Percent by weight not appropriate. Program cost shown is actual for summer steelhead

**Table 5b. Annual Operating Expenses: Ringold Spring Hatchery -
Summer Steelhead**

Expenditure Occurring at Lyons Ferry Hatchery

Component	1994	1995	1996
Personnel Costs			
Operational Costs			
Capital Costs			
Indirect Costs			
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs			
Total Hatchery Costs	data not available at this time	data not available at this time	data not available at this time
Source of Funds			
Program Production (#)			
Total Production (#)			
Program as Percent of Total			
Program Costs	data not available at this time	data not available at this time	data not available at this time

¹ When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

**Table 5c. Annual Operating Expenses: Ringold Spring Hatchery -
Summer Steelhead**

Expenditure Occurring at Skamania Hatchery

Component	1994	1995	1996
Personnel Costs			
Operational Costs			
Capital Costs			
Indirect Costs			
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs			
Total Hatchery Costs	data not available at this time	data not available at this time	data not available at this time
Source of Funds			
Program Production (#)			
Total Production (#)			
Program as Percent of Total			
Program Costs	data not available at this time	data not available at this time	data not available at this time

¹ When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 6a. Detailed Expenditures at Ringold Springs Hatchery by Program

Summer Steelhead

Component	1994	1995	1996
Personnel Costs			
Operational Costs			
Capital Costs			
Indirect Costs			
Lumped Hatchery Costs ¹	\$382,225	\$394,396	\$325,645
Lumped Third-Party Costs	\$0	\$0	\$0
Total Hatchery Costs	\$382,225	\$394,396	\$325,645
Source of Funds			
NMFS - 100%			
Program Production (lb)	175,648	168,217	167,548
Total Production (lb)	5,671,139	4,873,112	4,549,170
Program as Percent of Total	N/A	N/A	N/A
Program Costs²	\$100,000	\$100,000	\$100,000

¹ When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

² Percent by weight not appropriate. Program cost shown is actual for summer steelhead

Table 6b. Detailed Expenditures at Ringold Springs Hatchery by Program

Spring Chinook

Component	1994	1995	1996
Personnel Costs			
Operational Costs			
Capital Costs			
Indirect Costs			
Lumped Hatchery Costs ¹	\$382,225	\$394,396	\$325,645
Lumped Third-Party Costs	\$0	\$0	\$0
Total Hatchery Costs	\$382,225	\$394,396	\$325,645
Source of Funds			
NMFS (100%)			
Program Production (#)	1,278,000	1,180,000	1,025,494
Total Production (#)	5,671,139	4,873,112	4,549,170
Program as Percent of Total	N/A (1)	N/A (1)	N/A (1)
Program Costs²	\$262,225	\$274,376	\$185,645

¹ When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

² Percent by weight not appropriate. Program cost shown is actual for spring chinook

Table 6c. Detailed Expenditures at Ringold Springs Hatchery by Program

Fall Chinook

Component	1994	1995	1996
Personnel Costs			
Operational Costs			
Capital Costs			
Indirect Costs			
Lumped Hatchery Costs ¹	\$382,225	\$394,396	\$325,645
Lumped Third-Party Costs	\$0	\$0	\$0
Total Hatchery Costs	\$382,225	\$394,396	\$325,645
Source of Funds			
NMFS (100%)			
Program Production (#)	4,217,491	3,524,895	3,356,128
Total Production (#)	5,671,139	4,873,112	4,549,170
Program as Percent of Total	N/A	N/A	N/A
Program Costs²	\$20,000	\$20,000	\$40,000

¹ When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

² Percent by weight not appropriate as fish are on-station for only about 30 days . Program cost shown is actual for fall chinook